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Twentieth century vascular plant taxonomy in Portugal

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Abstract: We discuss the development of, and trends in, vascular plant taxonomy in Portugal during the 20th century, with emphasis on the institutions and taxonomists that were instrumental in advancing and facilitating this branch of scientific botanical endeavour. We show that the bulk of the nomenclatural novelties published by Portuguese botanists for elements of the vascular flora of the country, and beyond, were produced by a small group of 69 taxonomists who were mostly based at institutions in one of three Portuguese cities: Coimbra, Lisboa (Lisbon) and Porto. In all three instances the individuals were associated with local herbaria that were managed by universities, while in Lisboa other government-sponsored projects and institutions additionally played a pivotal role in the production of complete or partial Floras for Portugal and its former colonies. These individuals are comprehensively tabulated and biographical information is provided for all of them. With 440 names published, Rosette Mercedes Saraiva Batarda Fernandes (1916–2005), who worked at the University of Coimbra, was the most prolific taxonomist in terms of publishing new names. She was the sole author of more than half of these names. Biographies are provided for the ten most prolific Portuguese authors of vascular plant names.

Key words: authors, biography, history, plant names, Portugal, taxonomists, trends, vascular plants, 20th century

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Introduction

Few countries in the world are fortunate enough to have comprehensive historical information on the botanists who explored, collected and described the flora of a specific country or region. Such examples include the works of Gunn & Codd (1981) and Codd & Gunn (1985), and Dorr (1997), who documented extensive biographical and other historical information on the taxonomy of the S African flora, and that of Madagascar and the Comoro Islands, respectively. Several important Portuguese, or at least Portugal-affiliated, authors, who often worked in more than one country, have had their contributions to, and activities in, botanical science scrutinized and evaluated; these include, for example, Friedrich Welwitsch (see below), who worked in Portugal and Angola (Dolezal 1974), and Heinrich Willkomm (see below), who worked in the Iberian Peninsula (Devesa & Viera 2001). However, far fewer analyses have been conducted on, and less is known about, those who were the most productive authors of plant names for a specific country. When authors publish names for plants, they effectively contribute to the knowledge base of the biodiversity of a country or region. The publication of a name for a new

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taxon requires a description or diagnosis of that taxon, as well as the indication of a type, which is most often a preserved plant specimen, so enhancing the value of herbaria (Maxted & Kell 2003; Turland & al. 2018). The publication of a new combination based on a previously published name (the basionym) does not require a new description, but it implies a reclassification of the taxon; thus it is also a contribution to biodiversity knowledge. Species are widely considered to be the most important units of biodiversity (Claridge & al. 1997). The number of names published by scientists, particularly new species, reflects their contribution to documenting and disseminating information and knowledge about previously unknown or, at least in the view of that author, erroneously classified elements of biodiversity.

This paper aims to at least partially fill a glaring gap in the knowledge of the botanical history and flora of Portugal. The history of botany in the country is reasonably well documented up to the end of the 19th century, as a result of the publications of several authors stretching from the mid-1800s (e.g. Colmeiro 1858) to the late 1900s (e.g. Fernandes 1963, 1986). However, literature on the history of plant taxonomy in Portugal in the past century is scarce (e.g. Fernandes 1992). In contrast, the botanical history of some of the former Portuguese colonies has been documented in much greater detail up to their independence in the 1970s (see for example Gomes e Sousa 1939–1947; Fernandes 1982; Liberato 1994; Figueiredo & Smith 2008).

In this paper, we focus on those authors of vascular plant names who, during the 20th century, worked in Portugal and published new plant names. Therefore, Portuguese taxonomists who were based in other countries and conducted taxonomic work exclusively on other floras (e.g. that of Brazil) are excluded from these analyses. Alberto Júdice Leote Cavaco (1915–2001), who worked at the Museum d'Histoire Naturelle in Paris, mostly on Madagascan plants, but also on the flora of Angola, is included here. As far as we know he never collected plant material in Madagascar (Dorr 1997), but he collected in Angola (Figueiredo & Smith 2008).

Most of the authors referred to in our paper published only on the flora of Portugal and some of its colonies, especially those located in Africa, but others also published on other floras. Many other Portuguese botanists contributed extensively to knowledge on the flora and vegetation of Portugal and its colonies by researching and publishing on a range of different botanical topics and aspects. However, even though some contributed Flora accounts to various such projects, they did not publish new plant names (see Fernandes 1992). Although their work is also invaluable, they are not included in this account. Foreign botanists who contributed to the knowledge of the flora of Portugal and its colonies are also not included in this paper.

We trace the history of taxonomy in Portugal during the 1900s, with special emphasis on the authors of names of vascular plants (see Methods, below). Especial attention is given to the three main centres, Coimbra, Lisboa (Lisbon) and Porto, from where taxonomic work was conducted in the country.

The flora of Portugal

Continental Portugal, covering 92212 km^2, is a comparatively small country in SW continental Europe. It comprises about 16% of the Iberian Peninsula, especially the S part of which has a decidedly Mediterranean-type climate with winters mild and wet and summers warm to hot and dry (Ribeiro 1963). Especially in the south the vegetation of the country can be broadly classified into Mediterranean forests, woodlands and shrublands, also known as "macchia", a dense, evergreen, predominantly shrubby vegetation type, with more temperate forests and woodlands in the north (Daveau 1905; Braun-Blanquet & al. 1956, 1964; Rivas-Martínez & al. 1990; Costa & al. 1998, 2015). The flora is rich and diverse, at least in European terms (Medail & Quézel 1997); 3314 indigenous and naturalized species have been recorded for continental Portugal (Sequeira & al. 2012), with numerous taxa (137 species and subspecies) endemic to the country (Pereira & al. 2016).

The country has had a long and varied involvement in the botany, especially the taxonomy, of the vascular plants of both continental and insular (Azores, Madeira) Portugal. Having developed a significant maritime empire from the 1400s onward, the botany of the former Portuguese colonies was also viewed as of particular interest to the governments of the day (Ferrão 2005).

Historical background to the taxonomy of vascular plants in the 20th century in Portugal, and where the authors of plant names were based

At the dawn of the 20th century, three botanists, who all died within a 10-year period between World Wars I and II, were the main protagonists of vascular plant taxonomy in Portugal: (1) Júlio Henriques (1838–1928) at the University of Coimbra; (2) António Xavier Pereira Coutinho (1851–1939) at the Instituto de Agronomia e Veterinária and the Escola Politécnica in Lisboa; and (3) Gonçalo Sampaio (1865–1937) at the Academia Politécnica in Porto. Despite the considerable distance between these three cities, given the modes of transport available at the time, these three botanists entertained a lively correspondence and collaborated in their research (see, e.g., Cabral 2007, 2009).

This generation of taxonomists produced fundamentally important taxonomic works on the vascular plant flora of Portugal that are still used today: *Flora portuguesa* (Sampaio 1947, published posthumously), which was based on the series *Manual da flora portugueza* (Sampaio 1909–1914), *Flora de Portugal* (Coutinho 1913) and the numerous taxonomic works published in the periodical *Boletim da Sociedade Broteriana*, which was founded by

Henriques in Coimbra in 1880 and which he steered and edited (first series) until his death in 1928. By then, 28 volumes had appeared in the first series and five in the second series (Fernandes 1963). After the death of these three eminent botanists, research in the field of Portuguese vascular plant taxonomy changed significantly.

Early in the 20th century, institutional arrangements and the structure of higher education in Portugal also underwent dramatic changes that saw the University of Coimbra, one of the oldest universities in the world, forfeiting its monopoly on conferring degrees (Serrão 1983). Literally for centuries—the University of Coimbra was established in 1290—it was the only university in the country. The University of Évora had been established in 1559, but was closed two centuries later as a result of reforms implemented by the Marquis of Pombal (Silva 1992). However, in 1911 more universities were established through acts of the Portuguese government, including the institutions of higher learning created in the capital, Lisboa (the University of Lisboa) in C Portugal, and in Porto (the University of Porto), in the north of the country (Serrão 1983).

Fig. 1. Left to right: F. Mendonça, L. W. Carrisso, M. A. Exell, and J. Gossweiler in the 1937 expedition to Angola. – Photograph by Arthur W. Exell. – Private collection of Estrela Figueiredo.

The three main centres of taxonomic endeavour in Portugal in the 20th century

Porto — Still during the Sampaio period in Porto, the Academia Politécnica would be integrated into the new Faculty of Science, which had a Gabinete de Botânica and a herbarium (PO), which was established in 1892 (Folhadela & al. 1993). In the early 20th century Sampaio was very productive and collaborated with other botanists, such as the priest Alphonse Luisier (1872–1957), whom Sampaio commemorated in some species names (Cabral 2009).

In 1935, Américo Pires de Lima (1886–1966) replaced Sampaio as director of what was then known as the Instituto Botânico. Pires de Lima would hold the directorship until he retired. His interests in several different fields of science, including medicine, pharmacy and anthropology, resulted in plant taxonomy becoming somewhat diluted in his scientific endeavours (Universidade do Porto 2014). The next director, from 1960 to 1970, of what was by then called the "Instituto Botânico Dr Gonçalo Sampaio", as well as of the Institute's Botanical Garden (Smith & Figueiredo 2014a), which was established during the tenure of Pires de Lima, was Arnaldo Rozeira (1912–1984) (Universidade do Porto 2014). He was the last botanist from the institution to have published more than one name for vascular plants in the 20th century.

Coimbra — Júlio Henriques was inter alia instrumental in a number of important colonial botanical appointments while he was director of the Instituto Botânico, which included the herbarium of the Universidade de Coimbra (COI). For example, he appointed the indefatigable John Gossweiler (1873–1952), an extraordinary field naturalist, who later collected over 14 000 numbers in Angola between 1900 and 1950 (Martins 1994a; Figueiredo & Smith 2017). Henriques was also responsible for sending the gardener Adolfo Frederico Moller (1842–1920) on a botanical expedition to São Tomé in 1885 (Fernandes 1993), where 735 herbarium specimens were collected (Guimarães 2009), of which 326 are listed as types in JSTOR Global Plants (https://plants.jstor.org).

Henriques also acquired the Herbário Willkomm for the University of Coimbra in 1880 (Fernandes 1977). This collection formed the basis of the *Prodromus florae hispanicae* (Sales 1999). When Henriques retired from Coimbra in 1918, the directorship of the Instituto Botânico was assumed by one of his students, Luis Wittnich Carrisso (1886–1937), who had the daunting task of developing an institution that was, at the time, largely depleted in terms of staff (Fernandes 1939; Quintanilha 1975). In 1919 Carrisso contracted Aurélio Quintanilha (1892–1987), a biologist who had graduated from the University of Lisboa and would become an internationally known cytogeneticist (Stafleu & Cowan 1976–1988). At the suggestion of Quintanilha, Carrisso also contracted Francisco Mendonça (1889–1992), who was still a student at the University of Lisboa, to join the Instituto as Chief Gardener and later to be placed in charge of the herbarium COI (Quintanilha 1975). Mendonça would play a crucial role in the development of vascular plant taxonomy in the country, and in some of the Portuguese colonies over the ensuing decades.

In the late-1920s, Carrisso focused on developing studies of the floras of the Portuguese colonies in Africa. However, in 1937, at the age of 51, he died during one of the two botanical expeditions that he organized to Angola in S tropical Africa (Fig. 1). After a period under tempo-

rary direction, Abílio Fernandes (1906–1994) was finally appointed as the new director of the Instituto Botânico in 1942. Fernandes, who would fill the position of institutional director for 33 years, started his career as a cytologist, essentially under the influence of Aurélio Quintanilha (Quintanilha 1975), but eventually developed an interest in taxonomy. In his taxonomic work, Fernandes often drew on the expertise of his wife, Rosette Fernandes (1916–2005), and they published many taxonomic papers together (Fernandes 1992). Rosette Fernandes, a Naturalist at the Instituto Botânico since 1947, graduated from the University of Lisboa and would become the most productive Portuguese taxonomist in terms of authored vascular plant names in the 20th century.

Under the leadership of Abílio Fernandes, the initiative of Carrisso to promote the study of the floras of the Portuguese colonies in Africa was sustained. At the same time, A. Fernandes also made efforts to recommence studies on the Portuguese flora, which had been somewhat neglected during Carrisso's time. As part of efforts to promote investigations into the flora of Portugal, A. Fernandes arranged botanical expeditions that covered the length and breadth of the country. These collecting trips necessarily resulted in strengthening the preserved plant collections held at COI, with over 13 000 accessions added to the herbarium (R. Fernandes 1992). This collecting thrust diminished after 1975, when A. Fernandes retired, among other reasons because by then interest in plant taxonomy and systematics was waning (R. Fernandes 1992). However, several students who were at the Instituto during that period would continue in vascular plant taxonomy and later participate in the projects *Flora iberica* (see below) and *Flora de Cabo Verde*. Jorge Paiva (1933–), who was a student of A. Fernandes, had a major role in both projects. In the final quarter of the century, the Instituto became the Departamento de Botânica. None of the directors who came after Fernandes was a vascular plant taxonomist, and that field of science declined in the institution. In the 21st century, the Department would be terminated and integrated into the Departamento de Ciências da Vida.

Lisboa — With the changes introduced in higher education in Portugal in 1910, the newly established University of Lisboa had a Faculty of Science, into which the Escola Politécnica de Lisboa was integrated. The Politécnica dated from 1837 and had had a herbarium (LISU) since 1839, into which Pereira Coutinho deposited his collections after he left LISI (see below). It also had a Botanical Garden, the Jardim Botânico de Lisboa, which was created in 1878 (Smith & Figueiredo 2016). After Coutinho retired in 1921, Rui Palhinha (1871–1957) assumed directorship of the Instituto Botânico de Lisboa. He was mostly interested in the flora of the Azores islands (Palhinha 1966), where he was born, but he also produced the revised edition of Coutinho's *Flora de Portugal* (Coutinho 1939). In 1943, Palhinha was succeeded as director of the Instituto by Flávio Resende (1907–1967), a geneticist who, early in his career, had an association with A. Fernandes of the Instituto Botânico in Coimbra. Resende had a research interest in succulent plants, especially the S African *Asphodelaceae* subfam. *Alooideae*, and *Crassulaceae*. During his directorship, the Instituto struggled with infrastructural and staffing difficulties (Resende 1959). After Resende died in the mid-1960s, the publication of vascular plant names by individuals affiliated with LISU became largely incidental.

Reform in the higher education system in Portugal in the early 1900s also affected the Instituto de Agronomia e Veterinária in Lisboa, which would become the Instituto Superior de Agronomia. It would only reach University status in 1930 when it was integrated into the Universidade Técnica de Lisboa (presently integrated with the University of Lisboa). The Instituto had a herbarium (LISI) since 1879, and it was there that the *Nova Flora de Portugal* was produced by João do Amaral Franco (1921–2009), who directed the herbarium from 1969 to 1991. After Franco retired in 1991, the focus of research at LISI veered away from taxonomy and more toward vegetation science and phytosociology (Nicolson 2013). In the mid-20th century a group of agronomy students of João C. Vasconcellos (1897–1972) at the Instituto focused on floristics (Franco 1972). As was the case in Spain (Loidi 2004), it was at that time that the first agronomists (pharmacologists in Spain) with an interest in botany entered the field of phytosociology in Portugal (Myre & Silva 1949). A cadre of, at the time, young graduates or students such as José Gomes Pedro (1915–2010), Mário Myre (1908–1994) and Luís Grandvaux Barbosa (1914–1983) collaborated with Vasconcellos and Mendonça on collecting expeditions in Portugal during World War II to produce the comprehensive "Estudo fitogeográfico da Região Duriense" (Franco 1972). Many of these graduates later moved to the Portuguese colonies in Africa, where they continued to develop studies in floristics (Moreira 1994). An exception was the agronomist António Pinto da Silva (1912–1992), who remained in Portugal. In collaboration with collectors such as Bento V. Rainha (1912–1973) and Manuel da Silva (1916–1994), Pinto da Silva expanded on his endeavours in taxonomic-floristic surveys, so creating the reference collection that is now housed at the herbarium LISE. Silva later took charge of LISE, which was newly created in 1937 under the auspices of the Estação Agronómica Nacional, on the outskirts of Lisboa. Under his direction (1939–1982), LISE would be a new and additional basis of taxonomic studies on the flora of Portugal as well as, particularly, the vegetation science of the country (Malato-Beliz 1992). Over the last two decades of the 20th century, after Pinto da Silva retired, LISE became almost inactive. Myre and Pedro developed floristic surveys in Mozambique (Pedro & Barbosa 1955; Myre 1971) but, after the colonies became independent, they returned to Portugal and became involved in floristic surveys aimed at the delimitation of protected areas in the country: Myre (1983) in the region of Caparica at Almada (greater Lis-

boa, WC Portugal) and Pedro (1991) in Arrábida (Municipality of Setúbal, S of Lisboa, WC Portugal) (Malato-Beliz 1992). The fields of floristics and phytosociology remained strong at the Instituto Superior de Agronomia, where, at the end of the 20th century, these were the main foci of research rather than of collections-based taxonomy in which Franco had been engaged (Costa 2004).

In the second half of the 20th century, a new institution was created in Lisboa, the Centro de Botânica, which was dedicated to the production of colonial Floras. In 1937, after the return to Coimbra of the expedition to Angola during which Carrisso had died (see above), Mendonça, who was also a team member of the expedition, found himself in a challenging position as a result of conflicts with colleagues in academia. This prompted Mendonça to motivate the transfer of the African flora research projects to Lisboa (Exell 1984). This transfer was achieved through establishing the medium-term projects Missão Botânica de Angola (in 1937), the Missão Botânica de Moçambique (operational from 1942–1948) and the Missão Botânica de Angola e Moçambique (operational from 1953–1973), which Mendonça led until 1963. Eventually, these projects resulted in the creation of a new institution in Lisboa, in 1948, the Centro de Botânica (herbarium LISC). Mendonça directed the Centro de Botânica until 1959. At that time, and until 1974, the Lisboa-based Centro was put under the direction of Abílio Fernandes, who was also still the Director of the Instituto Botânico in Coimbra. As Fernandes was based in Coimbra, it was the taxonomist Eduardo Mendes (1924–2011)—an erstwhile student of Flávio Resende—who in practical terms managed the Centro in Lisboa (Martins 1994b). Mendes finally became its director from 1974 to 1986 (Smith & al. 2012). After he retired, in the late 1990s, the Centro employed eight full-time taxonomists, of which five were authors of plant names. This was one of the largest research groups in vascular plant taxonomy in the country, placing it at the same level as the herbarium in Coimbra (COI), which had six taxonomists, five of them authors of plant names. Nevertheless, the Centro de Botânica was terminated in 2015 and its herbarium LISC, which by then was the second largest in the country (after COI) was integrated into LISU.

Beyond the main taxonomic centres in Portugal (Coimbra, Lisboa and Porto), José Malato-Beliz (1920–1993) engaged in floristic studies, mostly of grasslands, at the Estação de Melhoramento de Plantas de Elvas (Alto Alentejo province) (Pina Madeira & al. 2014), where he created and strengthened the collections of the herbarium ELVE and later of the herbarium (UEVH) of the University of Évora (Pinto-Gomes 1993). The University of Évora had been re-opened in the 1970s.

As had happened with the deaths, in quick succession, of the three eminent botanists Coutinho, Henriques and Sampaio at the beginning of the 20th century, which at that time had left taxonomic botany in Portugal temporarily orphaned, the retirement of the generation that included A. Fernandes, R. Fernandes, Franco and P. Silva toward the end of the century also negatively impacted on progress in this field, despite numerous publications appearing at the time (see, e.g., Fernandes 1992). The small increase in the number of collections deposited in Portuguese herbaria after these botanists retired, as compared to the much higher increase in the number of specimens accommodated in Spanish herbaria (see Villar 2004), reflects this decline. The growth in the holdings of Spanish herbaria was largely driven by the *Flora iberica* project.

Recent Floras relevant to Portugal and its colonies

Flora europaea — By the end of the 1950s the second edition of the *Flora de Portugal* (Coutinho 1939) was out of print and outdated, because it inevitably excluded a considerable volume of information published in the preceding 30-odd years. This created a demand for the publication of a new Flora for the country. For this project, A. Fernandes suggested collaboration among the six main herbaria of the country to produce a Flora he entitled *Nova Flora de Portugal* (Fernandes 1959a). However, as the *Flora europaea* project was initiated in 1963 (Tutin & al. 1964–1980), a new Flora for Portugal was not developed and, instead, several Portuguese taxonomists contributed to the fledgling *Flora europaea*. Participants from Portugal in this continental-scale project included Pinto da Silva, M. L. Rocha Afonso, J. C. Vasconcellos and, more significantly, R. Fernandes and Franco. Soon after the *Flora europaea* was started, Franco commenced with producing a translation and adaptation of *Flora europaea* for Portugal, the *Nova Flora de Portugal* in three volumes. The first volume was published in 1971, but the whole initiative would take over three decades to accomplish, with the last volume only becoming available in 2003 (Franco 1971, 1984; Franco & Afonso 1994, 1998, 2003).

Flora iberica — In the 1980s, a new project, the *Flora iberica*, became the focus of vascular plant taxonomy in the Iberian Peninsula. This project is now approaching its 40th anniversary, and remains ongoing (Castroviejo & al. 1986–2017). Like the *Flora europaea* started in the 1960s, this was, and still is, a large-scale project occupying the scientific effort of Portuguese taxonomists, which impacts on the updating of the *Nova Flora de Portugal* or indeed on producing an entirely new Flora dealing only with Portugal. Most Portuguese taxonomists working on the flora of the country in the second half of the 20th century contributed genus accounts to *Flora iberica*, including M. T. Almeida, A. Coutinho (one of us), R. Fernandes, Franco, M. L. Gonçalves, I. Nogueira, J. Ormonde, M. L. Rocha Afonso, and J. Paiva, the last mentioned also the coordinator and editor of several family treatments (http://www.floraiberica.es). Even though some Portuguese botanists still participate in *Flora iberica*, this involvement has regrettably diminished over the years and is now largely incidental.

Colonial Floras — The interest raised by Carrisso on the flora of Africa resulted in the creation of the *Conspectus florae angolensis*, the first volume of which was published in 1937, the same year that Carrisso died in Angola (see above). It was edited by Mendonça and Arthur Wallis Exell (1901–1993), who was attached to the British Museum (Natural History). With World War II involving most of Europe, the *Conspectus florae angolensis* was interrupted for several years. It resumed after the war, and a further volume was published in 1951. Mendonça was also the founder of the *Flora zambesiaca* project (Exell 1984), with Arthur Exell and Hiram Wild (1917–1982), but part 1 of the first volume of the *Flora zambesiaca* was only published one year after Mendonça retired (Exell & Wild 1960). The weak participation of Portuguese botanists in the volume—only the small family *Nymphaeaceae* was authored by Mendonça—immediately raised concerns in Portugal given that the country was contributing financially to the project and that the Centro de Botânica had been created with the specific aim of producing Floras for the colonies (Tavares 1960).

While A. Fernandes was director of the Centro de Botânica, the *Flora de Moçambique* project was initiated as a translation (into Portuguese) and adaptation (for Mozambique) of the *Flora zambesiaca* project. The first fascicle was published in 1969. The ensuing years coincided with a turbulent political time in Portugal with a transition from a dictatorship under the Salazar-Caetano regime to a democracy, through what has become known as the Carnation Revolution, in 1974. At the same time, the Portuguese colonies in Africa (Angola, Guinea Bissau and Mozambique) were conducting guerrilla wars against Portugal's administrations in those countries. However, quite remarkably, during this period further volumes of the *Conspectus florae angolensis* were published, with the last one appearing under the directorship of Mendes: the fascicle on the *Crassulaceae* (R. Fernandes 1982). Eleven years later, a further fascicle came to light (Diniz 1993), which would be the last in the series, as the *Conspectus* was eventually abandoned unfinished. Similarly, production of the *Flora de Moçambique* was stopped, uncompleted, after 73 fascicles had been published, the last ones appearing in 2003. The same fate would befall the *Flora de Cabo Verde* (1995–2002), another series that was to be based on fascicles initiated at the Centro de Botânica in Lisboa in the early 1990s. Of all the projects on the flora of Africa that occupied the majority of the plant taxonomists in Portugal during the past half-century, only the *Flora zambesiaca* remains and is likely to be completed.

Herbaria in Portugal

The three main centres from which vascular plant taxonomy was conducted in Portugal in the 20th century each had access to significant herbarium collections that considerably expanded during that 100-year period. In the case of Coimbra and Porto, their herbaria were intimately associated with the Universities of Coimbra and Porto, respectively, while in the case of the Lisboa-based cluster of institutions, including the University of Lisboa, several herbaria were in operation, although a number of them now (early 21st century) have been consolidated.

The major herbaria in Portugal during the 20th century, as detailed in Holmgren & al. (1990), were:

COI — Herbarium of the Universidade de Coimbra, Coimbra, Portugal. Founded: 1772. Number of specimens: 800 000, specializing in Portugal and tropical Africa. Important collections (several held, including those of): L. A. G. Barbosa, H. Baum, J. A. Cardoso, L. W. Carrisso, A. W. Exell, A. Fernandes, R. Fernandes, J. Gossweiler, J. A. Henriques, E. J. S. M. Mendes, F. de A. Mendonça, F. M. J. Welwitsch and H. M. Willkomm.

LISC — Herbário, Centro de Botânica, Instituto de Investigação Científica Tropical, Lisboa, Portugal. Founded: 1948. Number of specimens: 213 000, specializing in tropical Africa, especially Angola, Mozambique, Guinea Bissau and the Cape Verde Islands. Important collections (several held, including those of): L. A. G. Barbosa, J. V. G. Espírito Santo, J. Gossweiler, E. J. S. M. Mendes and F. de A. Mendonça.

LISI — Herbário, Departamento de Botânica, Instituto Superior de Agronomia, Lisboa, Portugal. Founded: 1879. Number of specimens: 96 500, specializing in Europe, Portugal and the Azores. Important collections: J. M. de Carvalho, J. de Carvalho e Vasconcellos and A. X. Pereira Coutinho. The collections of J. do Amaral Franco and others, such as those of Ilídio Botelho Gonçalves (1922–2011) from the Azores, were also deposited in the herbarium LISI during the 20th century (Franco 1980).

LISU — Herbário, Instituto Botânica, Faculdade de Ciências, Universidade de Lisboa, Lisboa, Portugal. Founded: 1839. Number of specimens: 200 000, mainly Portugal, Azores, Madeira, Angola, Mozambique, São Tomé e Príncipe, Guinea Bissau, Cape Verde Islands. Important collections (several held, including those of): F. de A. Brotero, A. X. Pereira Coutinho, J. Pinto-Lopes and F. M. J. Welwitsch. The Brotero collection consists of only 337 numbers collected at a late period of his life (Coutinho 1916).

PO — Herbário, Instituto de Botânica Dr Gonçalo Sampaio, Universidade do Porto, Porto, Portugal. Founded: 1892. Number of specimens: 68 700, mainly Portugal. Important collections (several held, including those of): A. X. Pereira Coutinho, G. A. da S. F. Sampaio and F. M. J. Welwitsch. An update on the herbarium PO by Folhadela & al. (1993) corrected the number of specimens to 120 000.

Other herbaria listed by Holmgren & al. (1990) that were based in the Lisboa area included: CRCA (incorporated into LISI), LIG (defunct), LISFA, LISJC, LISM and LISVA. At the beginning of the 21st century, LISJC would be incorporated into LISC; later, LISC would be incorporated into LISU.

Table 1. Portuguese authors of vascular plant names in the 20th century. Authors are tabulated by date of birth. Standard forms of authors' names follow Brummitt & Powell (1992) (except spaces are used). Places and dates of birth and death are given where known. The names of women are prefixed with an asterisk (*) in the first column.

Name	Standard form	Place, date of birth – place, date of death	Reference(s)
Júlio Augusto Henriques	Henriq.	Cabeceiras de Basto, 15 Jan 1838 – Coimbra, 15 Jan 1928	Carrisso & Quintanilha 1930; Stafleu & Cowan 1976–1988
Joaquim de Mariz Junior	Mariz	Coimbra, 28 Jan 1847 – Coimbra, 1 Apr 1916	Henriques 1917; Stafleu & Cowan 1976–1988
António Xavier Pereira Coutinho	Cout.	Lisboa, 11 Jun 1851 – Alcabideche, 27 Mar 1939	Henriques 1922a; Palhinha 1940; Quintanilha 1941, 1951; Silva 1948; Stafleu & Cowan 1976–1988
José d'Ascensão Guimarães	J. A. Guim.	São Pedro, Faro, 22 Apr 1862 – Lisboa, 24 Feb 1922	Henriques 1922b
Carlos Azevedo de Menezes	Menezes	Funchal, 26 Aug 1863 – Funchal, 1 May 1928	Costa 1930; Stafleu & Cowan 1976–1988
Gonçalo António da Silva Ferreira Sampaio	Samp.	S. Gens de Calvos, Póvoa de Lanhoso, 29 Mar 1865 – Porto, 27 Jul 1937	Morais 1937; Cabral & Folhadela 2006; Stafleu & Cowan 1976–1988
Ruy Telles Palhinha	Palhinha	Angra do Heroísmo, 4 Jan 1871 – Lisboa, 13 Nov 1957	Quintanilha 1972
José Manuel Miranda Lopes	Miranda Lopes	Argoselo, Vimioso, Bragança, 21 Dec 1872 – Porto, 27 Jan 1942	Fernandes & Garcia 1943; Cabral 2009
Américo Pires de Lima	P. Lima	Areias, Santo Tirso, 23 Feb 1886 – Porto, 14 Aug 1966	Universidade do Porto 2014
Francisco de Ascenção Mendonça	Mendonça	Conceição, Faro, 30 May 1889 – Lisboa, 28 Sep 1982	Exell 1984; Stafleu & Cowan 1976–1988
António de Figueiredo Gomes e Sousa	Gomes e Sousa	Lisboa, 5 Feb 1896 – Johannesburg, South Africa, 23 Oct 1973	Figueiredo & al. 2017
João de Carvalho e Vasconcellos	Vasc.	Lisboa, 17 Nov 1897 – Lisboa, 25 Feb 1972	Franco 1972
José Gonçalves da Costa	J. G. Costa	Santa, Porto Moniz, Madeira, 3 Aug 1899 – Mozambique, 10 Dec 1968	J. Silva pers. comm.; Sequeira & Jesus 2015
Artur Augusto Taborda de Morais	Tab. Morais	Avidagos, Mirandela, 4 Jun 1900 – Luanda, Angola, 20 Jul 1959	Fernandes 1959b
José Gonçalves Garcia	J. G. Garcia	Arrifana, Guarda, 5 Oct 1904 – 21 Jun 1971	Fernandes 1971
António Rocha da Torre	Torre	Meadela, Viana do Castelo, 11 Jun 1904 – Santo Tirso, 20 Jan 1995	Gonçalves 1996
Abílio Fernandes	A. Fern.	Maçainhas, Guarda, 19 Oct 1906 – Coimbra, 7 Oct 1994	Paiva 1994; Paiva 1996a
*Ester Conceição Pereira de Sousa	E. P. Sousa	S. Sebastião da Feira, Oliveira do Hospital, 27 Nov 1907 – 16 Jan 1994	
Flávio Ferreira Pinto de Resende	Resende	Cinfães, 28 Feb 1907 – Lisboa, 1 Jan 1967	Linskens 1967; Lima-de-Faria 1967
Luis Gonçalves Sobrinho	Sobrinho	S. Pedro, Palmela, 1907 – Lisboa, 18 Aug 1969	L. G. Sobrinho filius pers. comm.
Mário Myre	Myre	Lisboa, 29 Dec 1908 – Paranhos, Porto, 10 Apr 1994	

(continued on next page)

Name	Standard form	Place, date of birth – place, date of death	Reference(s)
José Diogo Sampayo de Albuquerque d' Orey	D' Orey	Oeiras, 28 Jan 1910 – 30 Nov 1992	B. d' Orey pers. comm.
Manuel Cabral de Resende-Pinto	Res.-Pinto	Penafiel, Paredes, 29 Jan 1911 – Valongo, 31 Jan 1990	
*Quitéria de Jesus Gonçalves Pinto da Silva	Q. J. P. Silva	Montalegre, 20 May 1911 – Lisboa, 9 May 2005	M. Sequeira pers. comm.
Arnaldo Deodato da Fonseca Rozeira	Rozeira	São Tomé e Príncipe, 29 Apr 1912 – Porto, 8 Mar 1984	Caldas 1984
António Rodrigo Pinto da Silva	P. Silva	Porto, 13 Mar 1912 – Lisboa, 28 Sep 1992	Correia 1992; Saraiva 2013
Bento Victória Rainha	Rainha	Algueirão, Sintra, 5 Oct 1912 – Algueirão, Sintra, 1 Sep 1973	Silva 1974
Duarte Manuel de Castro e Almeida Pimentel de Sequeira e Abreu	Castro	Sintra, 25 Jul 1913 – Lisboa, 8 Feb 1978	
José de Barros Neves	J. B. Neves	Estoi, Faro, 26 Mar 1914 – Coimbra, 26 Feb 1982	Fernandes 1984
Luis Augusto Grandvaux Barbosa	Barbosa	Lourenço Marques, Mozambique, 5 Dec 1914 – Praia, Santiago, Cabo Verde, 28 May 1983	Moreira & al. 2009; K. G. Barbosa pers. comm.
Fernando Carvalho Fontes	Fontes	Ponte de Sôr, Alentejo, 31 Oct 1915 – Lisboa, 14 Apr 1983	A. Fontes pers. comm.
Alberto Júdice Leote Cavaco	Cavaco	Tavira, 4 Aug 1915 – Cascais, 1 Jun 2001	M. H. Cavaco pers. comm.
José Gomes Pedro	Pedro	Almada, 27 Mar 1915 – Azeitão, 27 Dec 2010	Capelo & Aguiar 2012
Manuel da Silva	M. Silva	Santo António dos Olivais, Coimbra, 11 Jan 1916 – Viana do Castelo, 28 Nov 1994	
*Rosette Mercedes Saraiva Batarda Fernandes	R. Fern.	Redondo, 1 Oct 1916 – Coimbra, 28 May 2005	Coutinho 2006
José Vicente Cordeiro Malato Beliz	Malato-Beliz	Lisboa, 25 Sep 1920 – Lisboa, 5 Jul 1993	Pinto-Gomes 1993; Lousã 1994
Carlos Mateus Romariz Monteiro	Romariz	Torres Vedras, 11 Nov 1920 – Lisboa, 9 Feb 2018	A. M. Loução pers. comm.; M. C. Freitas pers. comm.
João Manuel António Paes do Amaral Franco	Franco	Lisboa, 25 Jun 1921 – Lisboa, 8 May 2009	Heywood 2009; Sequeira 2009
Eduardo José Santos Moreira Mendes	Mendes	Lisboa, 26 Nov 1924 – Lisboa, 24 Sep 2011	Martins 1994b; Smith & al. 2012
Oscar Jacob Azancot de Meneses	Meneses	São Tomé e Príncipe, 9 Aug 1924 – Lisboa, 11 Nov 1994	
António do Nascimento Teles	Teles	Argoselo, Vimioso, Bragança, 1 Mar 1925 – Lisboa, 28 Oct 2006	P. Teles pers. comm.
*Maria da Luz de Oliveira Tavares Monteiro da Rocha Afonso	Rocha Afonso	Fundão, 23 Apr 1925 – Lisboa, 24 Dec 2017	M. J. R. Afonso pers. comm.
Manuel de Assunção Diniz	Diniz	Santo António dos Olivais, Coimbra, 26 Feb 1926 –	
Rui Manuel da Silva Vieira	R. M. S. Vieira	Funchal, 29 Mar 1926 – Funchal, 29 Aug 2009	
António Luís Belo Correia	Belo-Corr.	20 Jan 1930 – Lisboa, 22 Jan 2000	Catarino 2001
Jorge Américo Rodrigues de Paiva	Paiva	Cambondo, Cazengo, Angola, 17 Sep 1933 –	

(continued on next page)

Name	Standard form	Place, date of birth – place, date of death	Reference(s)
José J. A. H. de Bacelar	Bacelar	1934 – c. 1982	C. Rodrigues pers. comm.
*Maria Leonor de Sousa Gonçalves	Gonç.	Lisboa, 5 Oct 1934 – May 2004	Gonçalves 2006
Rui Indegário de Sousa Correia	R. I. S. Correia	Sá da Bandeira, Angola, 14 Jan 1935 – Louis Trichardt, South Africa, 6 Oct 1999	R. Correia fil. pers. comm.
*Isabel Mariana Simões Nogueira Manso	I. Nogueira	Lorvão, Penacova, 8 Jun 1935 – Coimbra, 16 Nov 1994	Paiva 1996b
José Henrique Pereira de Barros Ferreira	J. H. B. Ferreira	Viseu, 27 May 1937 –	Arquivo Digital da U. Porto 2015
António Esteves Gonçalves	A. E. Gonç.	Évora, 6 Feb 1939 – Lisboa, 1 Nov 2017	
Mário Fernandes Lousã	Lousã	Lourenço Marques, Mozambique, 14 Mar 1940 –	
*Maria Helena Rodrigues da Costa Duarte Ramos Lopes	R. Lopes	Cascais, 12 Apr 1940 – Cascais, 5 Jul 2005	M. R. Lopes pers. comm.
*Maria Teresa Fernandes de Almeida	M. T. Almeida	Évora, 17 Oct 1940 – Coimbra, 27 Jun 2009	
*Maria Adélia Gonçalves Diniz Martins	M. A. Diniz	Pai das Donas, Arganil, 12 May 1941 –	
*Cidália Maria Amaral Rodrigues	C. M. A. Rodrigues	Lobelhe do Mato, Mangualde, 18 Aug 1943 –	
José Eduardo Martins Ormonde	Ormonde	São Bartolomeu dos Regatos, Terceira, 28 Apr 1943 – Coimbra, 12 Jan 2004	
Eurico Sampaio Martins	E. S. Martins	Monteperobolso, Almeida, 18 Jan 1944 –	
*Alexandra C. S. Escudeiro	Escud.	Hong Kong, 3 Jun 1949 – Lisboa, 15 Aug 2013	A. I. Correia pers. comm.
*Maria Dalila Paula Silva Lourenço do Espírito Santo	Esp. Santo	1951–	
*Ana Isabel Vasconcelos Dias Correia	A. I. D. Correia	1953–	
José Carlos Augusta da Costa	J. C. Costa	1955–	
*Maria de Fátima Matias Sales Machado	Sales	1957–	
*Áurea Cristina Guedes Magalhães de Carvalho	Á. C. Carvalho	Porto, 16 Apr 1961 – Porto, 9 Sep 1997	R. Almeida pers. comm.
*Lígia Maria Ribeiro Pires Salgueiro Silva Couto	Salgueiro	1962–	
Carlos Francisco Gonçalves Aguiar	C. Aguiar	1963–	
*Estrela Paula das Neves Figueiredo	Figueiredo	1963–	
Jorge Henrique Capelo Gonçalves	Capelo	1965–	

The herbarium LISE was not listed in Holmgren & al. (1990), but the following information dating from 2002 (Thiers 2018+) applies:

LISE — Herbário, Fitosistemática e Geobotânica, Estação Agronómica Nacional, Oeiras P-2780, Portugal. Founded: 1937. Number of specimens: 90 000, Portugal, including Azores and Madeira, Spain, N Africa, Europe, and North America. Important collections: B. A. Barros Gomes, M. Bensaúde, J. de Carvalho e Vasconcellos, A. R. da Cunha, J. Eriksson, A. R. Jorge, J. M. Miranda Lopes, J. Percival, G. A. da S. F. Sampaio and Fr. Sennen. The collections of A. R. Pinto da Silva, not mentioned above, were also deposited at LISE (Stafleu & Cowan 1976–1988).

In the 20th century, 10 new herbaria were established in Portugal. Further to LISC and LISE, listed above, the following were initiated during the century: ALGU (Universidade do Algarve, Faro, 1988); AVE (Universidade de Aveiro, Aveiro, 1977); AZB (Universidade dos Açores, Ponta Delgada, 1982); ELVE (Estação de Melhoramento de Plantas, Elvas, 1948); HVR (Universidade de Trás-os-Montes e Alto Douro, Vila Real, 1979); LISFA (Instituto Nacional de Investigação Agrária, Oeiras, 1916); MADJ (Jardim Botânico da Madeira, Funchal, Madeira, 1960); and MADM (Museu de História Natural do Funchal, Funchal, Madeira, 1950).

In addition, five new herbaria were created in the Portuguese colonies in Africa: LMA and LMU (Lourenço Marques [Maputo], Mozambique, 1967 and 1964, respectively); LUA (Nova Lisboa [Huambo], Angola, 1941); LUAI (Luanda, Angola, date unknown); and LUBA (Sá da Bandeira [Lubango], Angola, 1950).

Methods

Based on analyses of data held in the International Plant Names Index (IPNI; http://www.ipni.org) and enquiries sent to local taxonomists, we compiled an inventory of individuals that constitutes all the Portuguese authors based in Portugal or its colonies who published vascular plant names in the 20th century. For many of these authors, biographical information, such as full and complete name and birth and death dates, were unavailable up to now and have never before been recorded in any database or published work. These gaps in information on Portuguese biodiversity specialists were filled for authors born before 1950 by tracing and questioning descendants and relatives, or investigating the archives of institutions or those of registry offices.

We compiled catalogues of the names published by each author, based on the data held in IPNI, complemented with information from *Flora iberica* and periodicals published in Portugal, such as *Boletim da Sociedade Broteriana*, *Agronomia Lusitana*, *Portugaliae Acta Biologica*, and *Silva Lusitana*, with some corrections. All names validly published by these authors were counted, including plant names of other, non-Portuguese or non-Portuguese-colonial floras, because some of the authors worked on taxonomic revisions that covered taxa from other countries. Names that were not validly published by these authors were not counted. In accordance with Turland & al. (2018: Article 6.9), "new names" here refer to names that were validly published (or for the sake of the analyses conducted as part of this study, presumably validly published) in their own right for new taxa (genera, subdivisions of genera, species and infraspecific taxa). Therefore, these "new names" were not based on previously validly published names and are not new combinations, names at new ranks, or replacement names. "New combinations" refer to new names that are based on legitimate, previously published names, which are their basionyms (Turland & al. 2018: Article 6.10).

Results and Discussion

Portuguese authors of vascular plant names published in the 20th century

We identified 69 individuals as Portuguese authors of vascular plant names published in the 20th century. For plant nomenclatural purposes, the standard form of their name(s) as well as biographical information for each of these authors are given in Table 1. Seventeen of these authors are female (25%); these are marked in Table 1 with an asterisk.

The counts for number of plant names validly published, new species and other new taxa, and number of co-authors on a name are given in Table 2. For authors who published plant names in the 20th century, and carried on doing so into the 21st century, the figures for plant names published in collaboration with others are given in Table 3. Table 4 provides the number of plant names authored in the 20th century by staff associated with the major Portuguese herbaria (COI, LISC, LISI, LISU, PO, LISE). Table 5 provides data on the time span during which Portuguese authors published vascular plant names, when they did so in more than one year in the 20th century and are no longer active.

The most prolific authors of vascular plant names for the flora of Portugal during the 20th century and the herbaria with which they were associated

Our data show that, in terms of names published, Rosette Fernandes was the most prolific author of vascular plant names for the flora of Portugal in the 20th century. Furthermore, as a result of her taxonomic activities, COI is the herbarium from where the highest number of vascular plant names was published (Table 2).

However, in terms of new species described, Alberto Cavaco was the most productive author. Therefore, when species are considered to be the basic units of biodiversity, Cavaco was the Portuguese author who most contributed

Table 2. Number of vascular plant names published by Portuguese authors during the 20th century, essentially based on records in IPNI. Authors are listed according to the total number of names published. The column "Herbarium" refers to the herbarium with which the author was associated when (s)he published names, if known. The column "New taxa other than species in 20th century" comprises only the names of subspecies, varieties, and supraspecific taxa, and excludes replacement names (nom. nov.) and new combinations (comb. nov.). Standard forms of authors' names follow Brummitt & Powell (1992) (except spaces are used).

Author (standard form)	Herbarium	Total names in 20th century	New species in 20th century	New taxa other than species in 20th century	Names published as single author	Names published as single author (%)	Maximum number of co-authors in a name	Further names in 19th or 21st centuries / as single author
R. Fern.	COI	440	132	61	252	63	1	
A. Fern.	COI	256	155	17	46	18	1	
Cavaco	P	250	205	14	190	76	1	
Samp.	PO	205	137	3	205	100	0	
Franco	LISI	193	27	54	162	84	1	
Mendonça	LISC	144	103	7	15	13	1	
Paiva	COI	127	39	14	88	69	2	13/2
Torre	LISC	112	92	1	90	80	1	
P. Silva	LISE	84	13	15	58	69	2	
Cout.	LISU	51	33	3	51	100	0	12/12
Diniz	COI	29	27	2	0	0	1	
Rocha Afonso	LISI	25	3	5	6	27	1	
I. Nogueira	COI	23	9	7	3	13	1	
Menezes	MADJ	20	15	2	20	20	0	
P. Lima	PO	19	19	0	19	100	0	
Vasc.	LISI	18	5	2	10	55	1	
Mendes	LISC	17	15	0	15	88	1	
Figueiredo	LISC	16	3	3	12	75	1	15/10
J. G. Garcia	LISC	14	7	0	9	64	1	
Resende	LISU	11	6	3	9	81	1	
Pedro	LMA	10	1	1	10	100	0	
A. E. Gonç.	LISC	9	4	0	8	88	1	
E. S. Martins	LISC	9	9	0	9	100	0	4/0
E. P. Sousa	LISC	8	7	0	5	62	1	
Romariz	LISU	6	6	0	6	100	0	
Teles	LISE	6	1	1	1	0	1	
Mariz	COI	5	4	1	5	100	0	10/10
Ormonde	COI	5	0	1	3	60	1	
Rozeira	PO	5	3	1	4	80	1	
Gonç.	LISC	4	2	0	3	75	1	
Henriq.	COI	4	4	0	4	100	0	19/19
J. G. Costa	MADJ	4	4	0	4	100	0	
Malato-Beliz	ELVE	4	0	0	4	100	0	
Meneses	LUBA	4	4	0	4	100	0	
Q. J. P. Silva	LISE	4	0	4	1	25	1	
R. Lopes	LISE	4	1	2	2	50	1	

(continued on next page)

Author (standard form)	Herbarium	Total names in 20th century	New species in 20th century	New taxa other than species in 20th century	Names published as single author	Names published as single author (%)	Maximum number of co-authors in a name	Further names in 19th or 21st centuries / as single author
Esp. Santo	LISI	3	1	1	0	0	4	3/0
J. A. Guim.	COI	3	2	1	3	100	0	3/3
J. C. Costa	LISI	3	1	2	0	0	4	16/0
Lousã	LISI	3	1	1	0	0	4	13/0
Sales	COI	3	1	0	3	100	0	9/2
Salgueiro	COI	3	2	1	0	0	1	
Tab. Morais	COI	3	1	1	3	100	0	
A. I. D. Correia	LISU	2	0	2	2	100	0	
Belo-Corr.	LISU	2	0	0	2	100	0	
Capelo	LISFA	2	0	2	0	0	1	13/1
D' Orey	LISJC	2	0	0	2	100	0	
Fontes	LISE	2	1	0	0	0	2	
Gomes e Sousa	LM	2	1	1	0	100	0	
J. B. Neves	COI	2	0	0	2	100	0	
M. Silva	LISE	2	0	2	1	50	1	
M. T. Almeida	COI	2	0	2	0	0	1	
Palhinha	LISU	2	0	0	2	100	0	
Rainha	LISE	2	0	2	2	100	0	
Á. C. Carvalho	PO	1	1	0	0	0	2	
Bacelar	LISU	1	0	0	0	0	1	
Barbosa	LUA	1	1	0	0	0	1	
C. Aguiar	BRESA	1	0	1	0	0	1	8/0
C. M. A. Rodrigues	LISU	1	0	0	0	0	1	
Castro	LISE	1	0	0	1	100	0	
Escud.	LISU	1	0	0	0	0	1	
J. H. B. Ferreira	PO	1	1	0	1	100	0	
M. A. Diniz	LISC	1	0	0	1	100	0	
Miranda Lopes	COI	1	0	0	1	100	0	
Myre	LISE	1	1	0	0	0	2	
R. I. S. Correia	LUBA	1	1	0	0	0	1	
Res.-Pinto	PO	1	1	0	1	100	0	
R. M. S. Vieira	MADJ	1	0	1	1	100	0	
Sobrinho	LISU	1	1	0	0	0	1	

to describing biodiversity in the 20th century. This is not unrelated to Cavaco being the only author on the list who was based in a foreign country; he worked at the Muséum National d'Histoire Naturelle, Paris, with access to very good herbarium collections and literature resources. During the 20th century, many Portuguese taxonomists encountered difficulties in terms of examining type material first hand and often lacked access to taxonomic and other literature. Interestingly, toward the end of the 20th century, a further, perhaps unanticipated difficulty for (not only) Portuguese taxonomists (but for botanists in general) arose from the insistence by many journal editors to have author names mentioned in submitted manuscripts using the standard forms proposed by Brummitt & Powell (1992). This often required examining protologues of names in publications that were not available in the coun-

Table 3. Trend in publishing plant names as a single author or collaboratively by authors who did so in the 20th century and carried on doing so into the 21st century.

Author (standard form)	Herbarium	Names published as single author: 20th century (%)	Names published as single author: 21st century (%)	Maximum no. of co-authors in a name: 20th century	Maximum no. of co-authors in a name: 21st century
C. Aguiar	BRESA	0 %	0 %	1	5
Capelo	LISFA	0 %	8 %	1	6
E. S. Martins	LISC	100 %	0 %	0	2
Esp. Santo	LISI	0 %	0 %	4	5
Figueiredo	LISC	75 %	66 %	1	2
J. C. Costa	LISI	0 %	0 %	4	6
Lousã	LISI	0 %	0 %	4	6
Paiva	COI	69 %	15 %	2	2
Sales	COI	100 %	22 %	0	1

Table 4. Number of plant names authored in the 20th century by staff associated with the major Portuguese herbaria (COI, LISC, LISI, LISU, PO).

Herbarium	Number of authors	Number of authors who published more than 10 names
COI	16	5
LISC	10	5
LISI	6	3
LISU	10	2
PO	5	2
LISE	9	1

try. Access to publications and type specimen images was only facilitated in the 21st century with the creation of online resources such as JSTOR Global Plants (Smith & Figueiredo 2014b) and the Biodiversity Heritage Library (BHL; https://www.biodiversitylibrary.org). However, large gaps remain in the availability of basic literature, such as protologues of plant names, and in gaining access to herbarium specimens and published and unpublished illustrations that have been designated as the types of names.

Our data also reveal that distinct taxonomic concepts were followed by the respective authors. Some authors published a high proportion of infraspecific names (e.g. R. Fernandes, P. Silva), and often made new combinations at other taxonomic ranks based on the very same names they had published earlier (e.g. Sampaio). Other authors apparently (because data on infraspecific taxa are incomplete) worked mostly or even almost exclusively at the species rank and described very few taxa at infraspecific ranks (e.g. Cavaco, Mendonça, Torre). At least to some degree, this relates to the level of knowledge of the floras on which they worked. For example, Cavaco, Mendonça and Torre studied the floras of Africa and some of its adjacent islands. These floras had then been explored and documented only for a short period of time and still required a much more fundamental alpha-taxonomic-level treatment. In contrast, by the 20th century, knowledge of the flora of Europe had expanded considerably because it had already benefited from several centuries of taxonomic endeavour. Producing refined classifications, as well as the description of (sometimes multiple) local variants in various continental countries, was beginning to shape plant taxonomy in Europe. Describing new taxa, especially species, from the colonial empire of Portugal was therefore much more possible than describing new species from continental Portugal. As one example, Friedrich Martin Josef Welwitsch (1806–1872), who worked extensively in Angola in S tropical Africa, made collections of c. 5000 species; about 1000 new species were described based on these specimens (Albuquerque & al. 2009). To put these figures into perspective, the flora of Angola as a whole consists of c. 7000 species (Figueiredo & Smith 2008; Figueiredo & al. 2018). Even though Welwitsch made his collections in the mid-1800s, the sets of specimens he amassed were still being studied well into the 20th century.

When considering authors who published more than 10 vascular plant names in the 20th century, our data (Table 4) show that the herbarium of the University of Coimbra (COI), with five authors, had the most productive staff when productivity is measured in this way. In total, COI had a complement of 16 staff members and associates who published plant names. COI is followed by the herbarium of the Centro de Botânica (LISC) with 10 authors, of whom five also published more than 10 names. The majority of these 26 authors who were associated with COI and LISC were biologists or had graduated in Natural History. Those at COI mostly graduated from the University of Coimbra, with the exception of R. Fernandes, who graduated from Lisboa. Of the 10 LISC authors, five graduated from the University of Lisboa and the other five from the University of Coimbra; four of the authors from Coimbra published more than 10 names.

After the retirement of Coutinho and Resende from the University of Lisboa (LISU), there were no significant authors (10 or more vascular plant names published) attached to that institution. The same situation ensued at the University of Porto (PO) after Pires de Lima retired, as well as at the Estação Agronómica (LISE) once P. Silva left. At the Instituto Superior de Agronomia (LISI), the three main authors were Franco, Rocha Afonso and Vasconcellos. Of the four authors P. Silva (LISE) and Franco, Rocha Afonso and Vasconcellos (all LISI), only Rocha Afonso was trained as a biologist, while the others had a background in agronomy.

Twenty authors (18 listed in Table 4, two additionally listed under LMA and MADJ in Table 2) published 10 or more names of vascular plants; nine of these authors had graduated from the University of Coimbra, five from the Instituto Superior de Agronomia in Lisboa, three from the University of Lisboa and one from the University of Porto, while the remaining two did not hold a degree. Evidently the core of teaching and practising vascular plant taxonomy in Portugal was, and remains, at the University of Coimbra, as is evidenced by the data we provide for vascular plant names published in the 20th century (Table 4).

When considering the academic background, i.e. biology or agronomy, of the authors of a significant number of vascular plant names, biology prevails, again as taught and practised at the University of Coimbra. Of the 20 main authors, 12 are biologists, nine from the University of Coimbra and three (R. Fernandes, Rocha Afonso, Mendes) from the University of Lisboa. In the second half of the 20th century, the teaching of plant taxonomy declined at the Universities of Porto and Lisboa as emphasis was preferentially placed on other subdisciplines such as ecology. As one consequence, the number of plant taxonomists emerging from these two universities started to decrease. At the University of Coimbra, plant taxonomy is still (early 21st century) taught as a course for a degree in Biology. At the beginning of the 20th century, the influence of Pereira Coutinho at the Instituto Superior de Agronomia in Lisboa was crucial to the formation of a school of taxonomy. He was an agronomist, a great botanist, and especially an inspiring educator, who enthused

Table 5. Time span during which Portuguese authors published vascular plant names, when they published names in more than one year in the 20th century and are no longer active.

Author (standard form)	Herbarium	Total names in 20th century	Publishing period	Length in years
Franco	LISI	193	1941–1997	56
A. Fern.	COI	256	1947–1993	49
Rocha Afonso	LISI	25	1948–1997	49
R. Fern.	COI	440	1952–2000	48
P. Silva	LISE	84	1939–1987	48
Mendonça	LISC	144	1927–1973	46
Samp.	PO	205	1900–1937	37
Vasc.	LISI	18	1940–1974	34
Cout.	LISU	51	1906–1936	30
Henriq.	COI	4	1888–1917	29
Palhinha	LISU	2	1939–1966	27
Menezes	MADJ	20	1901–1927	26
Cavaco	P	250	1949–1974	25
A. E. Gonç.	LISC	9	1976–1999	23
Mariz	COI	5	1884–1907	23
J. G. Costa	MADJ	4	1927–1950	23
Torre	LISC	112	1954–1976	22
I. Nogueira	COI	23	1971–1993	22
Rozeira	PO	5	1943–1964	21
Gonç.	LISC	4	1965–1984	19
Resende	LISU	11	1938–1956	18
J. A. Guim.	COI	3	1887–1904	17
M. Silva	LISE	2	1959–1976	17
Mendes	LISC	17	1960–1976	16
J. G. Garcia	LISC	14	1947–1962	15
Malato-Beliz	ELVE	4	1969–1984	15
Teles	LISE	6	1971–1980	9
Pedro	LMA	10	1947–1955	8
E. P. Sousa	LISC	8	1960–1968	8
Ormonde	COI	5	1973–1981	8
R. Lopes	LISE	4	1976–1982	6
Tab. Morais	COI	3	1936–1940	6
Diniz	COI	29	1954–1959	5
Rainha	LISE	2	1976–1980	4
P. Lima	PO	19	1921–1924	3
Romariz	LISU	6	1952–1953	1
Q. J. P. Silva	LISE	4	1973–1974	1

subsequent generations of biologists. This school was continued by Vasconcellos, and from it emerged plant taxonomists such as Franco and P. Silva and later, toward the end of the 20th century, botanists specializing in vegetation science. The lingering scarcity of plant taxonomists is often discussed (e.g. Wilson 2004), but this remains a problem that is only becoming aggravated with the exclusion from, or at least deemphasis of, taxonomy in university curricula.

Predictably, the authors who published the most names are those with the longest careers. With the first and last names that he published separated by 56 years, Franco's name-publishing career stretches over the longest period.

Women as authors of plant names and new combinations

The 20th century saw the emergence of the first Portuguese women as authors of names of new taxa and new combinations for vascular plants. Women also for the first time jointly and later individually published papers in vascular plant taxonomy in Portugal. The first Portuguese-born woman to publish vascular plant names appears to have been Rosette Fernandes, a biologist who graduated from the University of Lisboa in 1941. The first plant name she authored was published in 1952 in collaboration with her husband, Abílio Fernandes, who was then Director of the Botanical Institute at the University of Coimbra. It was only much later, after she had co-authored c. 60 names with her husband, that Rosette Fernandes published a plant name as a single author for the first time, in 1959. This happened shortly before another woman, Ester Pereira de Sousa (who was nine years older than Rosette Fernandes), published a vascular plant name for the first time, in 1960. Ester Sousa had graduated from the University of Coimbra in 1933, eight years before Rosette Fernandes graduated from the University of Lisboa. Sousa was a temporary assistant lecturer at that University for a short period in 1934 and later worked on the flora of Africa. Her professional career started soon after Portuguese women were given the right to vote, which only happened in 1931, while, in the United Kingdom, for example, voting rights for women dated from 1918.

This slow progress in recognizing the rights and roles of women in Portuguese society explains their minor involvement in botanical and other sciences at the beginning of the 20th century. The first woman to be admitted at the University of Coimbra, and the only female student at the University until 1896, was Domitilla de Carvalho (1871–1966), who graduated as a doctor in medicine in 1904 (Carvalho 2008). Later, in the 1940s, several women were already active in the field of botany in a broad sense. For example, at a congress held in Coimbra in 1944 to commemorate the bicentenary of the eminent botanist Brotero (Félix de Avelar Brotero 1744–1828, for whom the journal *Boletim da Sociedade Broteriana* was named), twelve women participated (Fernandes & Mendonça 1945). Half of the women gave presentations on subjects that ranged from vascular plant to fungal taxonomy, and cytology. Significantly, in the programme (Fernandes & Mendonça 1945: 10–19), the 70 male participants are listed with their titles, Prof. Dr. (i.e. Professor), Prof. (Lecturer), Dr. (a title commonly used in Portugal for those with university degrees), Engº (Engineer), Pe. (Priest), Tenente-Coronel (Lieutenant-Colonel) or without a title (those without a degree). However, the twelve women, who included the biologists Rosette Fernandes and Quitéria Pinto da Silva (see below), were consistently listed as "D." (Dona, meaning Ms.) regardless of their qualifications. In the same year that this Congress took place (1944), Leopoldina Ferreira Paulo (1908–1996) became the first woman to obtain a PhD in biology at the University of Porto (Santos 2011). This was some years after the first PhD was awarded to a woman at the University of Lisboa, in 1938. The recipient was Elza Fernandes Paxeco Machado (1912–1989), who graduated in humanities (Oliveira & Viana 1967). It was only much later, in 1956, that the University of Coimbra conferred that degree (PhD in humanities) on a woman: Maria Helena da Rocha Pereira (1925–2017).

To put the date, 1956, in which the University of Coimbra awarded a PhD to a woman for the first time into perspective, this came c. 80 years after the first woman, Helen Magill White, received a PhD from Boston University in the U.S.A. in 1877 (Division of Rare and Manuscript Collections 2002). This backwardness of academia at the University of Coimbra would severely impact on the career of Rosette Fernandes (see below). In the 1940s, when she joined the Instituto in Coimbra, R. Fernandes saw her ambitions to establish a career as a lecturer curtailed. When she wanted to apply for a position as Assistente (assistant lecturer), she was told (pers. comm. to one of us, A.C.) that "the University of Coimbra frowned upon the accession of ladies to a career in lecturing". In other parts of the world, female botanists were already established in the field of plant taxonomy. For example, by then Margaret R. B. Levyns (1890–1975) was already a Doctor in Science and had been a botany lecturer at the University of Cape Town, South Africa, since 1919 (Victor & al. 2016).

Ten years before this obstacle surfaced in the case of R. Fernandes (i.e. being discouraged from following a lecturing career), Ester Sousa had been appointed by the Instituto as "2ª Assistente Provisória" (temporary assistant lecturer). The negative feedback given to R. Fernandes about pursuing her desire to be a lecturer is indicative of management at the time, apparently reverting to a gender-bias that existed in the early 1930s. As a consequence, R. Fernandes followed a career as Naturalist and later Researcher. Therefore, not only did she not develop to her full potential, she was also not given the opportunity to teach and inspire the next generation

of taxonomists, to the detriment of plant taxonomy in Portugal, and likely also its colonies. Similarly, several decades later, Maria Teresa Almeida (1940–2009), also a botanist at the Instituto Botânico in Coimbra, on indicating the desire to do a PhD, was told by management that she could not do so. When enquiring about the reason for this impossibility, she was told it was because she was female (pers. comm. to one of us, A.C.). She eventually obtained her PhD from the University of Southampton, United Kingdom, so becoming the first woman with a PhD on the staff of the Instituto Botânico—a landmark in the history of the institution that only came to pass in 1980 (Carvalho 1992).

Unsurprisingly in plant taxonomy, the first woman to publish names for the flora of Portugal, including the then colonies of the country, was not the Portuguese-born Rosette Fernandes. Rather, the first woman we could trace to have contributed in this field of scientific endeavour was Mildred Alice Exell (1905–1990) from the British Museum (Natural History). She was then a student of Edmund Gilbert Baker (1864–1949), who was attached to the Royal Botanic Gardens, Kew. Edmund G. Baker was the son of John G. Baker, one of the most prolific authors of names for novel plants from the Crown Colonies of Great Britain in the late 1800s, including for plants from S Africa, which is abutted in the west and east by two Portuguese colonies, Angola and Mozambique, respectively. The younger Baker continued this tradition and, for example, worked on the flora of Rhodesia, now Zimbabwe (Baker 1899). Mildred Exell visited the herbarium at the University of Coimbra (COI) in 1934. While her husband Arthur Exell studied collections from São Tomé e Príncipe for a catalogue he would publish 20 years later (Exell 1944), Mildred Exell studied the collections of Gomes e Sousa from Mozambique (Figueiredo & al. 2017). In 1936 she published an account of these collections with the description of two new species (Exell 1937). She was also an active member of the 1937 Missão Botânica a Angola.

Rosette Fernandes was not only the first Portuguese woman to author plant names; she also became by far the most prolific Portuguese taxonomist of the 20th century in terms of names published. In our view, the merits of her work and contributions to plant taxonomy, not only in Portugal and its colonies but also on the *Flora europaea* project (for example), are not sufficiently acknowledged. She is commemorated in only two plant names, while a third one is named for the Fernandes couple (see below).

Rosette Fernandes and Ester Sousa, as well as Quitéria Pinto da Silva [a Naturalist at the Estação Agronómica Nacional (herbarium LISE) since the early 1940s, who published plant names in the early 1970s] were the wives of renowned botanists: Abílio Fernandes, Francisco Mendonça and António Pinto da Silva, respectively. It took a few more years for other women who developed a more independent interest in plant taxonomy to make contributions in this field. Later in the 20th century, women became more relevant in the field of plant taxonomy, with 17 here identified as authors of plant names. Several of these more recent authors (M. T. Almeida, A. I. Correia, M. A. Diniz, D. Espírito Santo, F. Sales) became the heads of herbaria in Portugal. Further to these authors, other women who did not publish names contributed significantly to the botany of Portugal, and beyond, through authoring papers, books and Flora accounts. Noteworthy examples are Maria Lisete Caixinhas (1942–), Maria Fernanda Pinto Basto (1938–) and Maria Paula Vidigal (1935–). By the early 21st century, the majority of the active Portuguese herbaria were curated by women (see Thiers 2018+). However, so far in 21st century, Portuguese men have authored the majority of the names published for plants newly recorded from Portugal.

Collaboration and joint authorship of plant names

Foreign authors — In the 19th and early 20th centuries, the flora of Portugal raised the interest of many non-Portuguese botanists, such as Jules Alexandre Daveau (1852–1929), Werner Walter Hugo Paul Rothmaler (1908–1962), William Trelease (1857–1945; Trelease 1897), and Heinrich Moritz Willkomm (1821–1895), who deposited important collections in local herbaria, LISU, LISE, AZ and COI, respectively. The floras of the colonies were also extensively explored and studied by, inter alia, Friedrich Welwitsch and John Gossweiler (see above). Some of these colonial botanists collaborated with their colleagues based in Portugal.

More recently, the floras of the Algarve, the southernmost province of Portugal, and the Madeira and Azores archipelagos have re-attracted the attention of several foreign botanists. This work has resulted in the publication of English-language Floras, florulas and field guides (e.g. Mabberley & Placito 1993; Press & Short 1994; Sjögren 2001; Schaefer 2005; Thorogood & Hiscock 2014; Thorogood 2016).

In spite of the proximity of Portugal to Spain, collaboration between Portuguese and Spanish taxonomists was not common until the 20th century (Fernandes 1963, 1982; Morales & Blanco 2013). This recent collaboration would continue into the 21st century. It was a consequence of the initiation of the *Flora iberica* project, but mostly the result of the establishment of a school of phytosociologists centred at the Instituto Superior de Agronomia in Lisboa (Moreira 1994).

Co-authorship of names — Vegetation surveys undertaken for phytosociological studies often lead to the discovery of new taxa. Because these discoveries were made during collaborative fieldwork, a new trend in the authorship of plant names began to take shape and would be further accentuated in the 21st century (Costa 2004). During the 19th and early 20th centuries, Portuguese authors of vascular plant names published nomenclatural

novelties mostly on their own, or with a single co-author. However, after the mid-20th century, starting with the author P. Silva, names originating from the group of botanists specializing in vegetation science that emerged from the Instituto Superior de Agronomia were published with three co-authors, and toward the end of the century with up to five co-authors. This trend would be continued with, for example, nine individuals (Spanish and Portuguese) co-authoring the name of a single species: *Erica platycodon* (Webb & Berthel.) Rivas Mart., Wildpret, del Arco, O. Rodr., P. Pérez, García Gallo, Acebes, T. E. Díaz & Fern. Gonz. (Rivas-Martínez & al. 1993) and further accentuated in the 21st century (Table 3) with seven individuals (again Spanish and Portuguese) co-authoring the name of a subspecies of that species: *E. platycodon* subsp. *maderincola* (D. C. McClint.) Rivas Mart., Capelo, J. C. Costa, Lousã, Fontinha, R. Jardim & M. Seq. (Rivas-Martínez & al. 2002). These citations may be shortened to *E. platycodon* (Webb & Berthel.) Rivas Mart. & al. and *E. platycodon* subsp. *maderincola* (D. C. McClint.) Rivas Mart. & al. (Turland & al.: Rec. 46C.2).

Standardization of author names

Since the publication of Brummitt & Powell (1992) on the standardization of the names of authors of nomenclatural novelties, most scientific and even popular journals and books that reference plant names have followed this influential work, which is nowadays kept up to date on the IPNI website. However, in the plant names databased in IPNI, many authors of those names appear under different forms, which can result in confusion. Examples from among the Portuguese authors listed here include: Castro given as "de Castro"; R.I.S.Correia given as "Correia"; J.G.Costa also given as "G.Costa"; A.Fern. used in one instance for the unrelated Afr.Fern.; R.Fern. also given as "R.Fernandes"; J.H.B.Ferreira given as "Ferreira" and "Ferr."; J.G.Garcia also given as "Garcia"; Guim. (abbreviation for António Luis Machado Guimarães) used for J.A.Guim.; R.Lopes also given as "Ramos Lopes"; Menezes used for two different authors (Menezes and N.L.Menezes); Nogueira and I.Nogueira both used for the same author (I.Nogueira); Teles used for two different authors (Teles and A.M.Teles); and Vasc. also given as "Carv." (for João de Carvalho e Vasconcellos).

Infraspecific taxa

The figures for infraspecific taxa (Table 2) are based on the information available in IPNI. However, the coverage of infraspecific names in IPNI is not complete. For some authors, therefore, the figure given in Table 2 is likely smaller than the real figure. This may affect in particular the authors Sampaio and P. Silva. Sampaio was known for his unorthodox view of plant nomenclature, having described numerous taxa under the category "raça" (see Morais 1937 for Sampaio's taxonomic concepts). Only three infraspecific taxa are listed in IPNI as having been authored by Sampaio, but the *Flora iberica* website provides a list of c. 500 infraspecific names authored by him. A partial list of plant names published by P. Silva also provided on the *Flora iberica* website includes c. 50 infraspecific names that are not databased in IPNI. Hence, in this analysis, the most robust data set is that referring to species (column 3 in Table 2).

Biographical information on the top 10 Portuguese authors of plant names in the 20th century

Biographical information is provided below for the Portuguese authors who published the highest number of vascular plant names in the 20th century. These include only one woman, Rosette Fernandes, who heads the list as the most productive author. These authors originate from all over Portugal, representing five of the six provinces, and with their birth places ranging from the capital city, Lisboa, to the tiny village of Maçainhas in the central interior.

All ten authors are commemorated in plant names, but not proportionately to their endeavour. The top authors R. Fernandes and Cavaco are commemorated in only three and two names, respectively, while Mendonça and Torre are commemorated in 23 and 28 names, respectively. One reason for this is that Mendonça and Torre were also major collectors of botanical specimens, and several of their gatherings serve as types of the names in which they have been commemorated by other botanists. Neither R. Fernandes nor Cavaco were significant collectors.

Rosette Mercedes Saraiva Batarda Fernandes (1 October 1916 – 28 May 2005)

Rosette Mercedes Saraiva Batarda Fernandes (Fig. 2) was born in Redondo, Alentejo, Portugal, on 1 October 1916, daughter of José Inácio Batarda and Berta de Jesus Saraiva Batarda. She graduated from the University of Lisboa in 1941 and later moved to Coimbra, where she started her career as a Naturalist in the Instituto Botânico in 1947. She remained at the Instituto until she retired as a Principal Researcher (Investigador Principal). With 440 names and new combinations published, Fernandes was arguably the most prolific taxonomist in Portugal in the 20th century. She was the sole author of more than half of these, which were for taxa mostly in the families *Anacardiaceae*, *Crassulaceae*, *Lamiaceae*, *Melastomataceae* and *Verbenaceae*. Fernandes described 173 new taxa, of which three were new genera. She published over 250 papers (Coutinho 2006), produced treatments for several Flora projects, including *Flora europaea*, *Flora iberica*, *Flora of Mozambique*, *Conspectus florae angolensis* and *Flora zambesiaca*, and participated in numerous scientific meetings. She also embarked on fieldwork and accompanied Josias Braun-Blanquet (1884–1980) on some of his ground-breaking phytosociological expeditions

Fig. 2. Rosette Mercedes Saraiva Batarda Fernandes. – Photographer unknown. – Private collection of António Coutinho.

Fig. 3. Abílio Fernandes. – Photographer unknown. – Portugal, Universidade de Coimbra, Faculdade de Ciências e Tecnologia, Departamento de Ciências da Vida, Arquivo Abílio Fernandes, Arquivo Fotográfico, Fotografia Abílio Fernandes (s/d) (call number: PT-UC-FCT-BOT/AF/F-01).

with P. Silva in Portugal (pers. comm. to one of us, A.C.). She identified 1860 exotic species cultivated at the Botanical Garden. Additionally, she was a good botanical artist. Later in life she published articles on the history of some cultivated plants, and on plants in heraldry and in popular poetry. Fernandes died in Coimbra in 2005 at the age of 88. Rosette Fernandes was married to Abílio Fernandes. She is commemorated in three plant names: *Cistus* ×*fernandesae* P. Silva (Silva 1980: 21), *Marsilea batardae* Launert (1983: 101) and *Memecylon fernandesiorum* Jacq.-Fél. (Jacques-Félix 1981: 1074, commemorating A. Fernandes and R. Fernandes as a couple).

Abílio Fernandes (19 October 1906 – 7 October 1994)

Abílio Fernandes (Fig. 3) was born in Maçainhas, in the district of Guarda, Beira Alta, Portugal, on 19 October 1906, son of José Fernandes and Maria Augusta Fernandes. He enrolled at the University of Coimbra in 1923, and finished his first degree in 1927 and his doctorate in 1931. He became a Professor (Professor Catedrático) in 1937 and five years later, in 1942, the director of the Instituto Botânico at that University. He held the directorship until 1974, retiring in 1975. From 1959 to 1974 he was also director of the Centro de Botânica in Lisboa. Fernandes's main area of interest was karyology and cytotaxonomy, developing research mostly on the genus *Narcissus* L. He published c. 350 scientific papers, among them a considerable number of papers in taxonomy, mostly with Rosette Fernandes and Manuel Assunção Diniz, an entomologist in the Zoology Department of the University of Coimbra. He was the recipient of several awards and distinctions, for example the gold medal of the American Daffodil Society in 1942; the médaille commémorative du troisième centenaire de la Société de l'Académie de Sciences de France in 1966; and the gold medal of the Organization for the Phyto-Taxonomic Investigation of the Mediterranean Area (OPTIMA) in 1979. From 1942 to 1974 he was president of the "Sociedade Broteriana". Fernandes remained active after retiring, later publishing papers on the history of science and botany in Portugal (Fernandes 1992, 1993). Fernandes was married (in 1942) to Rosette Fernandes, whom he had met in 1941 at a congress in Lisboa (Coutinho 2006). He died in Coimbra in 1994 at the age of 88. Fernandes is commemorated in 17 plant names (Paiva 1994).

Alberto Júdice Leote Cavaco (4 August 1915 – 1 June 2001)

Alberto Júdice Leote Cavaco (Fig. 4) was born in Tavira, Algarve, Portugal, on 4 August 1915. After concluding his first degree at the University of Coimbra, he worked as an assistant to António Rocha da Torre in Mozambique, in the expedition "Missão Botânica de Moçambique", which was led by Francisco Mendonça. The expedition

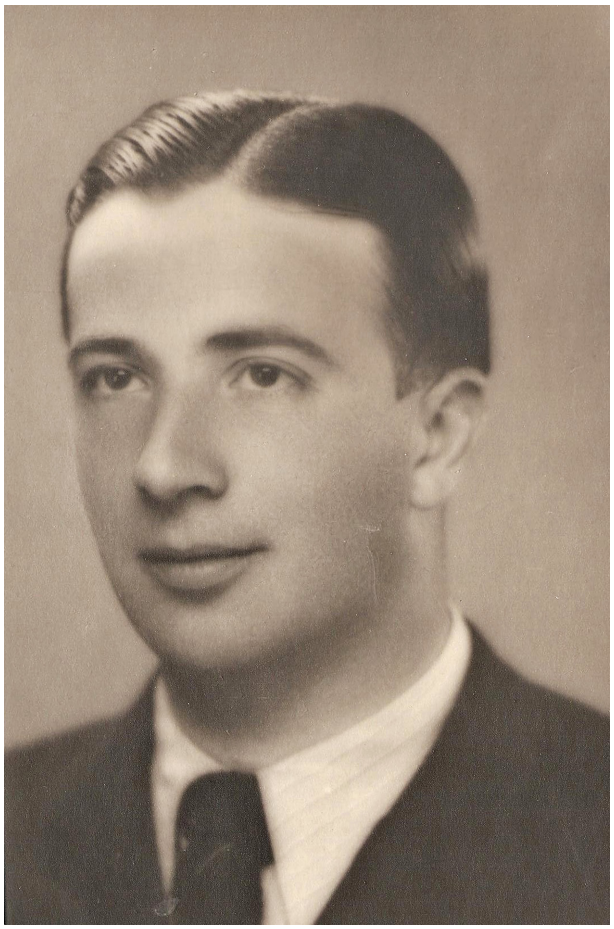

Fig. 4. Alberto Júdice Leote Cavaco. – Photographer unknown. – Private collection of Maria Helena Cavaco.

Fig. 5. Gonçalo António da Silva Ferreira Sampaio. – Photographer unknown. – Museu de História Natural e Ciência da Universidade do Porto.

lasted seven months, with the expeditionary force divided into teams. The team of Torre and Cavaco surveyed the grasslands S of the Save River, with the associated collecting activities resulting in more than 1080 specimens collected under Torre's name (Mendes 1980; Saraiva & al. 2012). Cavaco then worked for a while at the Laboratoire Arago in Banyuls-sur-Mer, France, and afterward obtained his PhD (Doctorat d'État) at the University of Montpellier. He became Maître de Recherches Attachés at the Muséum Nationale d'Histoire Naturelle, Paris, where he established and developed several scientific activities. Toward the end of the 1970s he collaborated with the Faculty of Sciences of the University of Lisboa and was involved in the Sociedade Portuguesa de Ciências Naturais. Cavaco died at the age of 86 in Cascais in 2001 (Maria Helena Cavaco, pers. comm.). He is commemorated in two plant names, the genus *Cavacoa* J. Léonard (1955: 320) and *Schizolaena cavacoana* Lowry & al. (1999: 193).

Gonçalo António da Silva Ferreira Sampaio (29 March 1865 – 27 July 1937)

Gonçalo António da Silva Ferreira Sampaio (Fig. 5) was born in the small enclave of São Gens de Calvos, Póvoa de Lanhoso, Portugal, on 29 March 1865, son of Livania da Conceição Ferreira Sampaio. His studies were erratic; he left the Liceu (secondary school) in Braga to enrol at the Escola Normal do Porto to become a school teacher, but soon abandoned that and returned to the Liceu. From there he registered at the University of Coimbra to study for a degree in mathematics, but he also abandoned that. In 1891, he enrolled at the Academia Politécnica do Porto, where he studied botany but did not obtain a degree. Nevertheless, his interest in botany resulted in being appointed as Naturalist in 1901 at that Polytechnic, and in 1910 he became a lecturer in the same institution. Two years later, he was appointed as a Professor at the newly created Faculty of Sciences of the University of Porto, and the following year as Director of the "Gabinete de Botânica". As a consequence of getting involved in political turmoil, Sampaio was arrested and detained for some months in 1919 (Cabral 2009). When he was released, he resumed his career, retiring in 1935. Sampaio was a well-known botanist with interests that ranged from lichens to nomenclature. He published many papers on the flora of Portugal, including the fascicles of the *Manual da flora portugueza* (1909–1914), which would form the basis for the posthumously published *Flora portuguesa* (Cabral & Folhadela 2006). He died in Porto in 1937 at the age of 72 and is commemorated in eight vascular plant names.

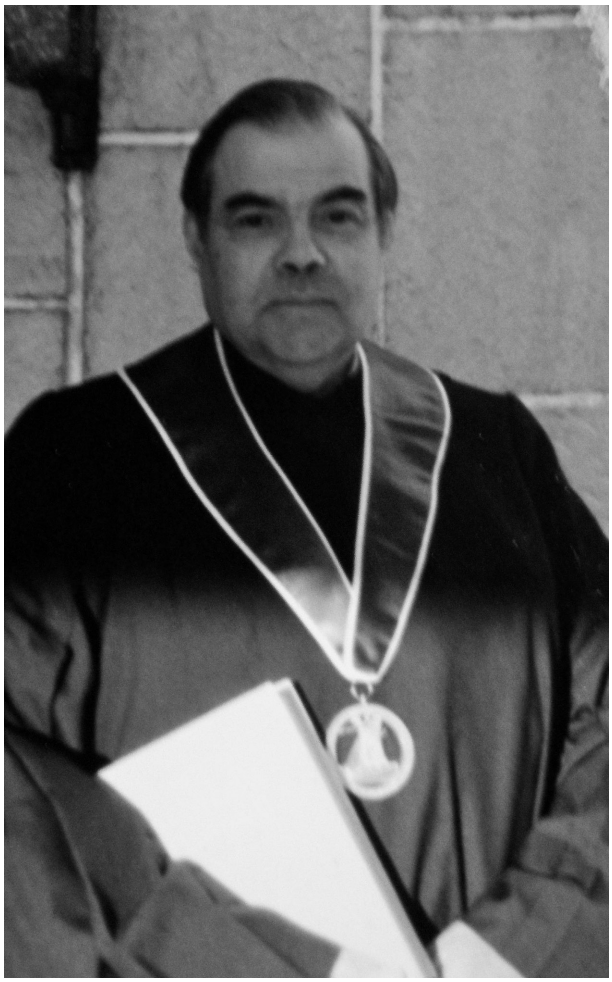

Fig. 6. João Manuel António Paes do Amaral Franco. – Photographer unknown. – Private collection of Luísa Franco.

João Manuel António Paes do Amaral Franco (25 June 1921 – 8 May 2009)

João Manuel António Paes do Amaral Franco (Fig. 6) was born in Lisboa, Portugal, on 25 June 1921, son of Frederico Gaspar Schindler Franco Castelo Branco and Maria Rita de Sá Paes do Amaral. In 1939, while still an undergraduate student of agronomy, he started collaborating with J. C. Vasconcellos at the herbarium of the Instituto Superior de Agronomia (LISI) in Lisboa (Franco 1972). He soon became a lecturer teaching practical classes on systematic botany and phytogeography and was in charge of the herbarium. With his involvement, and that of some other collaborators of Vasconcellos at LISI, the collections increased from 30 000 accessions in 1940 to 60 000 in 1980 (Franco 1940, 1980). In 1982, he became a Professor Catedrático (Professor), retiring in 1991 from the same institution where he had started as a student. Influenced by his forestry mentor, Mário de Azevedo Gomes (1885–1965), Franco's research started in dendrology, especially on conifers, but he soon developed an interest in taxonomy, phytogeography and the chorology of the flora of Portugal, publishing several papers on these topics (Sequeira 2007). He collaborated on both *Flora europaea* and *Flora iberica* and, with M. L. Rocha Afonso, produced the *Nova Flora de Portugal*. Franco authored 193 plant names and combinations. He remained active in botany until his death in Lisboa in 2009 at the age of 87. He is commemorated in three plant names: *Teucrium francoi* M. Seq. & al. (Sequeira & al. 2008: 643), *Festuca francoi* Fern. Prieto & al. (Fernández Prieto & al. 2008: 497) and, more recently, *Centaurea francoi* Figueiredo & Gideon F. Sm. (Figueiredo & Smith 2018: 99).

Francisco de Ascenção Mendonça (30 May 1889 – 28 September 1982)

Francisco de Ascenção Mendonça (Fig. 7) was born in Conceição, Faro, in the Algarve, Portugal, on 30 May 1889, son of Agostinho Martins Moreno and Ana de

Fig. 7. Francisco de Ascenção Mendonça. – Photographer unknown. – Portugal, Universidade de Coimbra, Faculdade de Ciências e Tecnologia, Departamento de Ciências da Vida, Arquivo Fotográfico de Botânica, Documentário Africano, "Saurimo (Lunda)." (call number: PT-UC-FCT-BOT/F/01-280; original caption: "Saurimo (Lunda). Na chana. Setembro 1927").

Jesus Mendonça. He was drafted into the army during World War I, but fortunately missed the train that took the ill-fated troops to the front in France (Exell 1984). He taught in a secondary school in Lisboa for a short time. Mendonça was a student of Pereira Coutinho, who much admired his observational capacities and botanical instincts (Quintanilha 1975). In 1921, he had almost completed work toward his degree when he accepted a position as Chief Gardener of the Instituto Botânico at the University of Coimbra. He obtained his degree at that University only in 1926, but held the Gardener position until 1929, when he became a Naturalist in the same institution. It was in that position, when he was 45, that he met Arthur W. Exell, who was then 33, when Exell visited Coimbra in 1934 to study material from São Tomé and Príncipe. At that time, the recently graduated 27-year-old Ester de Sousa was also based in the herbarium. Mendonça and Ester would marry in 1943 in Lisboa. Mendonça took part in two historical expeditions to Angola in 1927 and 1937 and became the Chief of the Missão Botânica de Moçambique from 1942 to 1948. In 1952 he was appointed director of the new Centro de Botânica in Lisboa. Mendonça's partnership with Exell resumed after World War II and the two, with Hiram Wild of Zimbabwe (Southern Rhodesia at the time), led the intergovernmental negotiations for the establishment of the *Flora zambesiaca* project. Mendonça was above all a good field naturalist and superb collector (Exell 1984), and highly regarded by his colleagues, "uma jóia de rapaz […] bom e são como um pêro [a jewel of a man, good and fit as a fiddle]" (see Quintanilha 1975: 33). He retired in 1963 and died in Belém, Lisboa, in 1982 at the age of 92. Mendonça is commemorated in 23 plant names.

Fig. 8. Jorge Américo Rodrigues de Paiva. – Photographer unknown. – Private collection of Jorge Paiva.

Jorge Américo Rodrigues de Paiva (17 September 1933 –)

Jorge Américo Rodrigues de Paiva (Fig. 8) was born in Cambondo, Cazengo, Angola, on 17 September 1933. He attended primary school and high school in Luanda, finishing the high school studies in Coimbra, Portugal. He obtained his first degree at the University of Coimbra in 1958 and his doctorate at the University of Vigo, Spain, in 1993. In 1959 he joined the Instituto Botânico of the University of Coimbra, and worked on the Floras of Angola and Mozambique. In 1961 he became a Naturalist and in 1964 an Assistente. Still later he became a Researcher (Investigador) at the same institution, and eventually retired as Investigador Principal. Paiva is one of the better known Portuguese taxonomists, both in Portugal and internationally, as a result of his contributions to the taxonomy of the large, widespread genus *Polygala* L., his collaborative work on several African Flora projects, and as one of the founders of the *Flora iberica* project. In Portugal, his work as an environmentalist and educator has led to numerous appearances in the media in support of biodiversity conservation and environmental protection. He has been awarded several prizes for his work in science and also in environmental education. Paiva is commemorated in ten plant names.

António Rocha da Torre (11 June 1904 – 20 January 1995)

António Rocha da Torre (Fig. 9) was born in Meadela, Viana de Castelo, Minho, Portugal, on 11 June 1904, son of António Geraldo da Torre and Francisca Soares da Rocha. He graduated in Natural History (Ciências Histórico-Naturais) and in Pharmaceutical Sciences (Farmácia) at the University of Coimbra, c. 1931. Shortly after graduating, he travelled to Mozambique as a civil servant, disembarking at the port of Lumbo in 1933 to take up a position as a pharmacist (Torre 1940). From 1940 to 1944 he was redeployed to do vegetation surveys in Mozambique, and in 1945 he returned to Europe to work with Mendonça in the Missão Botânica de Moçambique to produce a vegetation map of the colony. Torre was an excellent collector, with over 19 000 numbers accessioned, as well as an indefatigable field botanist, who in addition published several taxonomic papers (Gonçalves 1996). Torre described 93 new taxa, the great majority of them as a single author. His herbarium

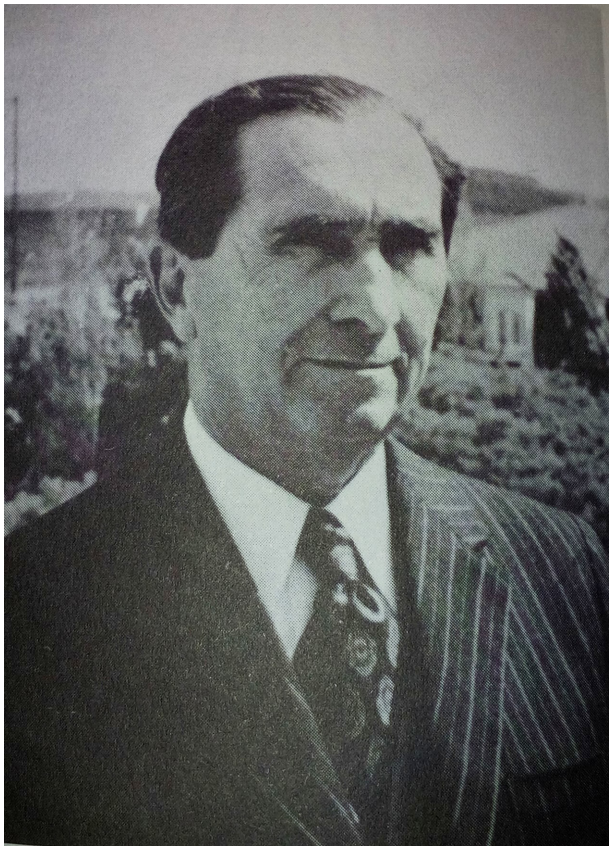

Fig. 9. António Rocha da Torre. – Photographer unknown. – Departamento de Ciências da Vida, Faculdade de Ciências e Tecnologia da Universidade de Coimbra.

Fig. 10. António Rodrigo Pinto da Silva. – Photograph by José G. Passos. – Provided by the photographer, via Wikimedia Commons (licence: CC BY-SA 3.0).

collections have led to the discovery of many new taxa, which is reflected in the 28 plant names that commemorate him (Saraiva & al. 2012). This arguably makes him the most commemorated modern-day Portuguese botanist. Torre retired to Santo Tirso, Porto, where he died in 1995 at the age of 90.

António Rodrigo Pinto da Silva (13 March 1912 – 28 September 1992)

António Rodrigo Pinto da Silva (Fig. 10) was born in Cedofeita, Porto, Portugal, on 13 March 1912. He graduated in agronomy in 1937 at the Instituto Superior de Agronomia in Lisboa, where he was a student of J. C. Vasconcellos. In 1939, he started his career at the Estação Agronómica Nacional, where he was placed in charge of the Departamento de Fitossistemática e Geobotânica in 1942, a job he held until his retirement in 1982. He was active as a botanist, managed the herbarium (LISE), and with his assistants made significant collections and gathered data on the phytogeography of the flora of Portugal and the Azores. Pinto da Silva is also known as a phytosociologist, having been from a generation of phytosociologists who included J. Gomes Pedro, L. Grandvaux Barbosa, J. Malato-Beliz and M. Myre. He participated in several field work excursions with the eminent J. Braun-Blanquet and A. Rozeira (Braun-Blanquet & al. 1956, 1964). Pinto da Silva was also a pioneer in ethnobotany and palaeobotany studies in Portugal. Numerous publications, in which he described new taxa, many in collaboration with others, emanated from his work as a botanist. Pinto da Silva edited the fascicles "De Flora Lusitana Commentarii ad Normam Herbarii Stationis Agronomicae Nationalis" in the periodical *Agronomia Lusitana* between 1949 and 1980. He was involved in plant nomenclature, and in 1950 was Chairman of the then Committee for Spermatophyta (now the Nomenclature Committee for Vascular Plants) of what is today known as the *International Code of Nomenclature for algae, fungi, and plants*. Pinto da Silva was also a contributor to the *Flora europaea* project. After retiring, he collaborated with the herbarium LISU until his death in Lisboa in 1992 at the age of 80 (Correia 1992). He is commemorated in six plant names.

António Xavier Pereira Coutinho (11 June 1851 – 27 March 1939)

António Xavier Pereira Coutinho (Fig. 11) was born in Lisboa, Portugal, on 11 June 1851, the son of Martinho de França Pereira Coutinho and Maria da Penha de França Baena Falcão de Magalhães. After graduating as an Agronomist from the Instituto Geral de Agricultura in

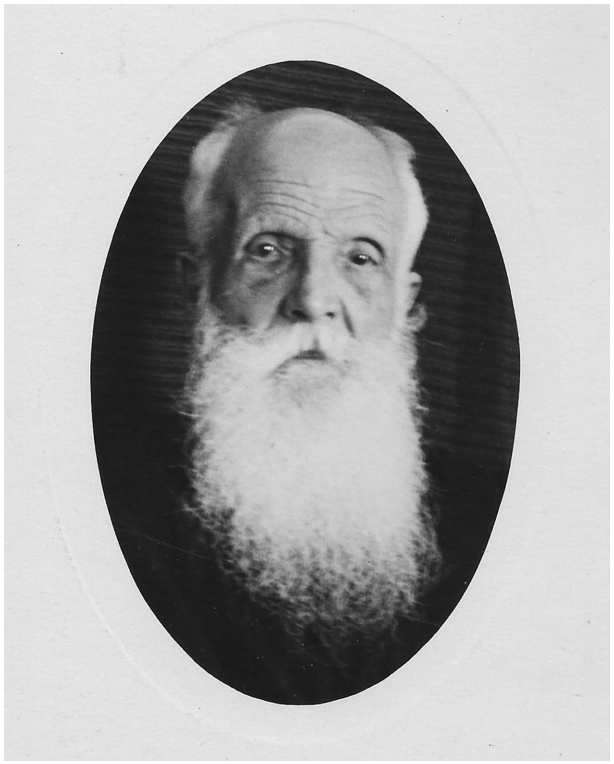

Fig. 11. António Xavier Pereira Coutinho. – Photographer unknown. – Private collection of António Coutinho.

Lisboa in 1874, he moved to Bragança in the N Portuguese province of Trás-os-Montes, where he established research projects in agriculture. Three years later he was transferred to Coimbra, and finally, in 1879, returned to Lisboa to the Instituto from which he had graduated. In Lisboa, he presented lectures in several different courses (Silva 1948). Pereira Coutinho was very committed to the teaching of botany, and he wrote a number of textbooks that were aimed at audiences ranging from primary school children to university students. At the Instituto in Lisboa he initially conducted agricultural research, for example on vineyards, but later dedicated himself to studying the flora of Portugal. He published an extensive bibliography on the flora, which culminated in his masterpiece, the *Flora de Portugal* in 1913. During his career, Pereira Coutinho was very much influenced by Júlio Henriques, who was based in Coimbra and with whom he corresponded; the two eventually met by chance on a train journey. At the beginning of the 1890s, 11 years after he had returned to Lisboa, Pereira Coutinho moved from the Instituto to the Escola Politécnica, where he replaced the Count of Ficalho as Professor and Director of the Botanical Garden (Tavares 1969). Dom António, as he was addressed, was widely admired for his exceptional work ethic, integrity, high moral standards, and love of science (Quintanilha, cited by Fonseca 2015: 220). In the hands of Pereira Coutinho, botany was a "living, organised and passionate science" (Quintanilha 1951: 24), which he taught through practical lessons only (Quintanilha 1941). This was a revolutionary and highly effective approach to teaching plant sciences that, along with his published works, influenced and shaped his students, including Rui Palhinha, Aurélio Quintanilha (1892–1987) and J. C. Vasconcellos; Palhinha was to replace Pereira Coutinho when he retired. His user-friendly Flora, which reflects his deep knowledge of the plants, is still frequently consulted as a reference work more than 100 years after it was published. After retiring, Pereira Coutinho continued to publish notes on the Portuguese flora and to collect specimens, particularly in the valley of the Ribeira de Caparide near Cascais, where he died, on his farm, in 1939 at the age of 87. He is commemorated in 11 plant names.

Conclusions

The involvement of Portuguese botanists in investigating and describing the vascular plant flora of the country during the 20th century laid the foundation for the publication of immensely useful taxonomic products, including Floras, which are still used today. Further, through the assessment and incorporation of these Floras into the regional *Flora iberica* project, a plant-taxonomic backbone was created for Portugal that facilitated the production by a younger generation of Portuguese botanists of other derived, popular products, such as Flora-on (Pereira & al. 2016). This new wave of botanists originated from among the students of the Faculty of Sciences of the University of Lisboa, who in 2009 created the Sociedade Portuguesa de Botânica (http://www.spbotanica.pt). Their enthusiasm influenced other botanists, who similarly became involved in disseminating information on the Portuguese flora in ways easily accessible to laypersons though an online platform (http://flora-on.pt). With enormous strides having been made over the past two decades in the advancement of worldwide web-based information and communication technology, the Flora-on project, based in Portugal and concerning the Portuguese flora, fulfils a profoundly useful role to enable the rapid dissemination of floristic information to the general public (Pereira & al. 2016). With the involvement of adequate taxonomic expertise to curate and improve the taxonomic backbone, this platform could ultimately evolve into an online Flora of Portugal.

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